CLAIMS:

1. A method for color-correcting multi-channel color image signals from a digital camera having multi-channel image sensors to account for variations in scene illuminant comprising the steps of:

a) determining the scene illuminant; and

b) determining an optimum color-correction transformation in response to the scene illuminant which transform minimizes color errors between an original scene and a reproduced image by adjusting three or more parameters.

2. The method of claim 1 wherein the scene illuminant is determined using an optical color temperature detector on the digital camera.

3. The method of claim 1 wherein the scene illuminant is determined from the relative color signals produced by photographing a neutral object in the scene.

4. The method of claim 1 wherein the scene illuminant is determined by analyzing the color image data for the scene.

5. The method of claim 1 wherein the scene illuminant is determined by having a user select the scene illuminant from a list of scene illuminants.

6. The method of claim 1 wherein the digital camera is a digital still camera.

7. The method of claim 1 wherein the digital camera is a digital video camera.

8. The method of claim 1 wherein the optimum color-correction transformation determining step includes combining the color errors are minimized by combining the color errors for a set of typical scene colors and determining the optimum color-correction transformation that minimizes the combined error.

9. The method of claim 8 wherein the combined color error is the root mean square ΔE^* value for the set of typical scene colors, the root mean square ΔE^* value being given by

$$\Delta E^*_{RMS} = \sqrt{\sum_{i=0}^{N} \Delta E^*{}_i^{2}}$$

where N is the number of typical scene colors, i is a particular typical scene color, and

$$\Delta E^*_i = \sqrt{(L^*_{si} - L^*_{di})^2 + (a^*_{si} - a^*_{di})^2 + (b^*_{si} - b^*_{di})^2}$$

is the CIELAB color difference between the scene color values for the i^{th} typical scene color specified by L^*_{si}, a^*_{si}, and b^*_{si}, and the corresponding color of the reproduced image specified by L^*_{di}, a^*_{di}, and b^*_{di}.

10. The method of claim 1 wherein the color-correction transformation is a color-correction matrix having adjustable matrix coefficients.

11. The method of claim 10 wherein the optimum color-correction transformation is determined by determining the adjustable matrix coefficients that minimize the color errors between the original scene and the reproduced image.

12. The method of claim 11 wherein the matrix coefficients that minimize the color errors between the original scene and the reproduced image are determined by minimizing the color errors for a set of typical scene colors.

13. The method of claim 12 wherein the optimum color-correction transformation determing step includes minimizing color errors by minimizing the root mean square ΔE^* value for the set of typical scene colors, the root mean square ΔE^* value being given by

$$\Delta E^*_{RMS} = \sqrt{\sum_{i=0}^{N} \Delta E^*{}_i^{2}}$$

where N is the number of typical scene colors, i is a particular typical scene color, and

$$\Delta E^*_i = \sqrt{(L^*_{si} - L^*_{di})^2 + (a^*_{si} - a^*_{di})^2 + (b^*_{si} - b^*_{di})^2}$$

is the CIELAB color difference between the scene color values for the i^{th} typical scene color specified by L^*_{si}, a^*_{si}, and b^*_{si}, and the corresponding color of the reproduced image specified by L^*_{di}, a^*_{di}, and b^*_{di}.

14. The method of claim 1 wherein the color-correction transformation is an adjustable three-dimensional look-up table that stores output color values for a lattice of input color values.

15. The method of claim 1 wherein information describing the determined scene illuminant is stored as part a data structure used to store the color image signals.

16. The method of claim 15 wherein the information describing the determined scene illuminant is an illuminant color temperature.

17. The method of claim 15 wherein the information describing the determined scene illuminant is an illuminant spectrum.

18. The method of claim 15 wherein the information describing the determined scene illuminant is an identifier for one of a set of possible scene illuminants.

19. The method of claim 1 wherein information describing the optimum color-correction transformation is stored as part a data structure used to store the color image signals.

20. The method of claim 19 wherein the information describing the optimum color-correction transformation includes matrix coefficient values for a color-correction matrix.

21. The method of claim 1 further including the step of applying the optimum color-correction transformation to the color image signals in the digital camera.

22. The method of claim 1 further including the step of applying the optimum color-correction transformation to the color image signals in a digital image processor adapted to receive the color image signals from the digital camera.

23. The method of claim 1 wherein the color-correction transformation transforms the color image signals from the digital camera to color image signals adapted for display on a video display device.

24. The method of claim 1 wherein the color-correction transformation transforms the color image signals from the digital camera to device-independent color image signals.

25. The method of claim 1 wherein the multi-channel image sensors are red, green, and blue image sensors.

26. A method for color-correcting multi-channel color image signals from a digital camera having multi-channel image sensors to account for variations in scene illuminant comprising the steps of:

a) determining the scene illuminant;

b) classifying the scene illuminant into one of a set of possible scene illuminants; and

c) selecting a color-correction transformation in response to the classified scene illuminant from a set of color-correction transformations, each transformation having been predetermined to minimize color errors between an original scene and a reproduced image for a particular classified scene illuminant.

27. A method for color-correcting multi-channel color image signals from a digital camera having multi-channel image sensors to account for variations in scene illuminant comprising the steps of:

a) determining the scene illuminant;

b) determining channel-dependent neutral-balance transformations responsive to the scene illuminant to be applied to the multi-channel color image signals to form neutral-balanced color image signals, the neutral-balance transformations being adapted to produce equal signal levels for scene colors that are neutral; and

c) determining an optimum color-correction transformation in response to the scene illuminant which transform minimizes color errors between an original scene and a reproduced image by adjusting three or more parameters.

28. An apparatus for color-correcting multi-channel color image signals from a digital camera having multi-channel image sensors to account for variations in scene illuminant, comprising:

a) means for determining the scene illuminant; and

b) means for determining an optimum color-correction transformation in response to the scene illuminant which transform minimizes color errors between an original scene and a reproduced image by adjusting three or more parameters.

29. The invention of claim 28 further including a digital camera for producing multi-channel color signals.